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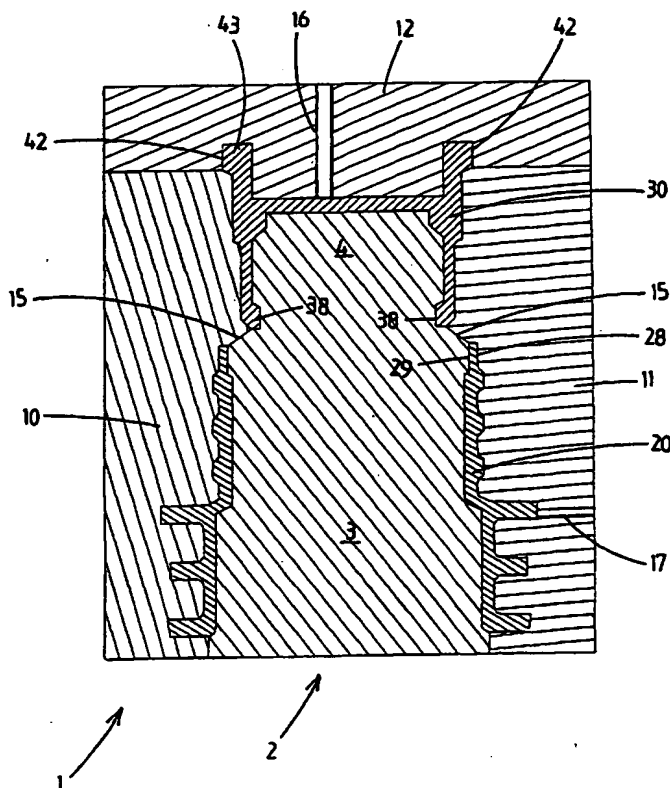
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(54) Title: ASSEMBLY FOR A CLOSABLE FLUID CONNECTION



(57) Abstract: A mould and method for the injection-moulding of an assembly for creating a closable fluid connection, and an assembly. The assembly comprises a female element (20) and a stopper (30) which is used to close off a bore (27) in the female element (20). The mould comprises a core with a core (2) with a core body (3) and a head (4). Furthermore, the mould comprises a mould ring which is composed of a plurality of mould parts (10, 11) are designed in such a manner that the mould cavity for the stopper (30), is located at a distance from the mould cavity for the female element (20). The mould parts (10, 11) of the mould ring which lie around the core (2) together delimit an annular sealing surface (15), by means of which the mould ring, in a zone between the mould cavity for the stopper (30) and the mould cavity for the female element (20), bears in a sealing manner against the core (2) during the injection moulding, so that the mould cavities are completely separated from one another.

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Assembly for a closable fluid connection

According to a first aspect, the present invention relates to the injection-moulding of an assembly for a closable fluid connection, in particular to an injection mould and the use of this mould.

5

The assembly for creating a closable fluid connection comprises a female element and an associated stopper, the female element having a body with a bore which extends through the body and with a seat, which extends around the bore, for the stopper, which is used to close off the bore.

10

A mould for the injection-moulding of an assembly of this type for creating a closable fluid connection is known, for example, from NL 1012020. In this known mould, it is provided that the mould cavity for the stopper is in communication, via a narrow annular gap, with the mould cavity for the female element, so that during injection moulding an integral film joint is formed between the two components of the assembly.

15

Furthermore, in the known mould it is provided that the plastics material is injected via a first runner which opens out in the mould cavity for the stopper. The plastics material then passes into the mould cavity for the female element via the narrow annular gap.

20

25

After the assembly has cooled, in the known mould the mould parts which form the mould ring are moved apart, and then the core is pulled out. In the process, the stopper becomes clamped onto the head of the core, and as a result the integral film joint between the stopper and the female element tears and the stopper moves into the seat of the female element. Then, the head of the core is uncoupled from the stopper, and the assembly, which is now in its closed state, can be ejected from the mould.

30

WO 99/05446, in the name of the applicant, has disclosed an assembly for creating a closable fluid connection in which the stopper is integral, via flexible arms, with the female
5 element. The injection mould used has a core with a head which defines the interior of the stopper and with a core body which defines the bore in the female element. Furthermore, the mould has a mould ring, which is composed of two mould parts, with a parting plane in the plane of the arms. These mould parts,
10 together with the core, form a single mould cavity for the female element, the stopper and the flexible arms. The stopper becomes clamped onto the head of the core and can be pulled into the seat in the female element as a result of the core being pulled out.

15 WO 93/07084 has disclosed an assembly in which the female element is designed to be secured in the neck of a dimensionally stable vessel, in particular a water tank. In this case, the stopper and the female element are produced in
20 separate injection moulds and are assembled subsequently.

The fluid may be any type of flowing material, such as a liquid, a fluid substance, a gas, a (fine) powder, etc. Therefore, assemblies of this type have a wide range of
25 applications. For this reason, the assemblies are generally produced in very large numbers, and consequently the cost price has to be as low as possible.

It is an object of the first aspect of the present invention to
30 provide an improved mould with which it is possible to injection mould an improved assembly.

The present invention achieves this object by providing a mould according to the preamble of claim 1 which is characterized in
35 that the core and the mould parts are designed in such a manner that the mould cavity for the stopper is situated at a distance from the mould cavity for the female element, and in that the mould parts of the mould ring which lie around the core

together delimit an annular sealing surface, by means of which the mould ring, in a zone between the mould cavity for the stopper and the mould cavity for the female element, bears in a sealing manner against the core during injection moulding, so
5 that the mould cavities are completely separate from one another, and in that one or more second runners are provided, which open out in the mould cavity for the female element.

The fact that the mould according to the invention provides
10 both a mould cavity for the stopper and a completely separate mould cavity for the female element and, moreover, that in the mould according to the invention one or more separate runners for the molten plastic are associated with each mould cavity, means that various drawbacks of the moulds according to the
15 prior art are eliminated and new possibilities are obtained.

By way of example, one of the drawbacks of the mould described in NL 1012020 is that a high injection pressure is required in order to force the molten plastic through the narrow gap,
20 resulting in the formation of undesirable stresses in the assembly. Furthermore, the narrow gap makes it difficult to impart an additional pressure to the mould cavity for the female element after filling, which has an adverse effect on the dimensional accuracy.

25 Another drawback of NL 1012020 is that the shrinkage of the female element and of the stopper is identical after injection moulding, which makes it difficult to achieve the desired sealing action.

30 With the mould according to the invention, it is possible to obtain optimum injection of plastics material into each of the mould cavities.

35 It is particularly advantageously possible to inject a first plastics material into the mould cavity for the stopper and a second plastics material into the mould cavity for the female element.

The plastics materials may be significantly different plastics materials, although it is also conceivable, for example, for the differences to be minor. By way of example, it is possible
5 for only the colour or the elasticity, the shrinkage, etc. to differ.

In an advantageous method with uses the mould according to the invention, it is provided that the first plastics material,
10 used for the stopper, after cooling has a different hardness from the second plastics material, used for the female element.

The use of different plastics materials, in particular of materials with hardnesses which ultimately differ, can
15 advantageously be exploited in order to obtain a reliable seal between the stopper and the female element.

In one possible embodiment, the stopper has a lower hardness than the female element, although the reverse is, of course,
20 also possible with the mould according to the invention.

The injection of the first and second plastics materials into the respective mould cavities preferably takes place substantially simultaneously, in order in this way to achieve a
25 production rate which is as high as possible.

The mould according to the invention also makes it possible for a plastics material to be injected only into the mould cavity for the female element or into the mould cavity for the
30 stopper, while no plastics material is injected into the other mould cavity. As a result, the mould can then be used to produce only female elements or only stoppers.

The second aspect of the invention relates to an assembly for
35 creating a closable fluid connection in accordance with the preamble of claim 13.

WO 99/05446 has disclosed an assembly in which the stopper is

provided, on the side which faces the female element, with elastic hook members, each hook member having both an inwardly directed hook surface and an outwardly directed hook surface.

5 The bore in the female element forms an annular shoulder, behind which the outwardly directed hook surfaces engage when the stopper is in its seat. The inwardly directed hook surfaces can engage on a shoulder of a male element which is to be fitted into the bore and the stopper.

10

It is an object of the second aspect of the invention to provide an improved assembly.

15 In particular, it is an object of the second aspect of the invention to provide an assembly with an improved action of the hook members.

20 The second aspect of the invention provides an assembly according to the preamble of claim 13, which is characterized in that the stopper is provided with one or more first hook members and with one or more second hook members, the first hook members each having an outwardly directed hook surface and the second hook members each having an inwardly directed hook surface.

25

30 The second aspect according to the invention makes it possible to separately optimize the action of the first hook members and the second hook members. It will be clear that in this solution the designer then has a great deal more freedom than with the hook members according to the prior art.

The first and second hook members are preferably arranged alternately around the circumference of the stopper.

35 In a preferred embodiment, the assembly also comprises a male element having a tube-shaped part which fits into the bore in the female element and is provided with an internal passage for the fluid, the male element having a head and a shoulder which

lies behind the head, and having a recess for accommodating the inwardly facing hook members of the stopper, with the result that the stopper is coupled to the male element.

5 It will be clear that the assembly according to the second aspect of the invention may if desired be produced using the mould and injection-moulding method according to the first aspect of the invention. On the other hand, it will also be clear that the assembly according to the second aspect of the
10 invention can also be produced using moulds and methods in accordance with the prior art.

The aspects of the invention will be explained in more detail below with reference to the drawing, in which:

15 Fig. 1 shows a cross section through a preferred embodiment of the mould according to the invention after the injection-moulding of the plastics material.
Fig. 2 shows a perspective view from the side of the stopper of the assembly which has been produced using the mould shown in
20 Fig. 1,
Fig. 3 shows the assembly from Fig. 2 in a view from the side of the stopper,
Fig. 4 shows a cross section on line IV-IV in Figure 3,
Fig. 5 shows a cross section on line V-V in Figure 3, and
25 Fig. 6 shows a quarter segment of the stopper shown in Figures 1-5 in accordance with the second aspect of the invention.

Figure 1 shows a mould 1 for the injection-moulding of an assembly for creating a closable fluid connection, which
30 assembly comprises a female element 20 and an associated stopper 30.

To make it easier to interpret Figure 1, the design of the assembly which is to be injection-moulded using the mould will
35 now be explained with reference to Figures 2-6.

The assembly which is shown is intended to create a fluid connection for, for example, liquid, gas, fluid substances,

powders, such as for example soap, cosmetic cream, beverages, syrup, etc.

5 The female element 20 has a body with a front side 25 and a rear side 26, an axial, substantially cylindrical bore 27 extending through the body from an insertion opening 24 for a male element at the front side 25, which bore 27 is open at both its ends.

10 On the rear side 26, the bore 27 is delimited by a projecting annular wall 28 of the body. The inner side of the annular wall 28 forms a seat 29, which extends around the bore 27, for the stopper 30, which stopper 30 is used to close off the bore 27.

15 The bottom part of the body of female element 20 is designed in particular to be sealed between two walls of a flexible plastic pouch.

20 In an embodiment which is not shown, the body of the female element could also, in a different design, be formed so that it can be placed into the neck of a bottle, tank or other container or the like or in an annular securing member arranged on a flexible pouch. The latter design is known in particular for what are known as bag-in-box systems.

25 In addition, the assembly of stopper and female element may also have an associated male element (not shown), which has a tubular part which fits into the bore 27 in the female element 20 and has a head at the end. In the male element, there is an
30 internal axial passage for the fluid. The axial passage is open at one end and is provided with one or more openings at the head at the other end. By way of example, the male element is provided with a number of transverse passages which connect the axial passage, in the vicinity of a blind end thereof, to the
35 outer circumference of the male element.

The stopper 30 has an annular wall 31 and an end wall 32 and a cavity 33 which is open towards the insertion opening 24, which

cavity 33 is intended to receive the head of the male element.

5 The end wall 32 forms a cylindrical recess 34, the diameter of which is matched to the diameter of a cylindrical projection of the head of the male element. This complementary shape ensures that the stopper 30 remains in the correct position on the head and cannot tilt.

10 As can be seen inter alia from Figure 6, the stopper 30 has hook fingers 37, 38 arranged around the circumference on the side which faces the insertion opening 24 of the female element 20.

15 In this arrangement the first hook fingers 37 only have an outwardly facing hook surface, and the second hook fingers 38 only have an inwardly facing hook surface. The first and second hook fingers 37, 38 are in this case arranged alternately, for example two or four of each type being present.

20 The hook fingers 37, 38 can spring radially inwards and outwards under the influence of the forces acting on the hook fingers 37, 38. In this context, the sprung action can be tuned by suitable dimensioning of the hook fingers, in particular the length and cross section of the hook fingers. In particular,
25 the sprung action of the hook fingers 37 can be tuned independently of that of the hook fingers 38.

In the closed position of the stopper 30, the outwardly facing hook fingers 37 engage behind a shoulder surface 40 of the
30 female element 20 and in this way contribute to holding the stopper 30 in the seat (Fig. 4).

The inwardly facing hook fingers 38 are intended to engage behind an associated shoulder surface of the head of the male
35 element, in order in this way to hold the stopper 30 on the head of the male element when the stopper 30 is pulled into seat 29.

As will be explained below, the inwardly facing hook fingers 38 also play a roll in relation to the injection-moulding and ejection of the assembly.

- 5 In a variant which is not shown, it is possible for the stopper to be provided with an encircling collar instead of hook fingers, as is known, for example, from WO 99/05446.

10 The mould 1 comprises a core 2 with a pin-shaped core body 3 and with a head 4, which forms the free end of the core 2.

The head 4 of the core 2 defines the cavity 33 in the stopper 30. The core body 3 defines the bore 27 in the female element 20.

15

Furthermore, the mould 1 comprises a mould ring which extends around the core 2 and has a first mould part 10 and a second mould part 11, which each extend over 180° around the core 2 and over the length of the core 2. Furthermore, the mould 1
20 comprises a third mould part 12, which extends transversely with respect to the head of the core 2.

The mould parts 10, 11, 12 together with the core 2, form a mould cavity for the stopper 30 and a mould cavity, which lies
25 in line with the mould cavity for the stopper 30, for the female element 20.

The mould parts 10, 11, 12 can be moved apart in order for the assembly to be ejected after injection-moulding.

30

The core 2 and the mould parts 10, 11, 12 are designed in such a manner that the mould cavity for the stopper 30 is situated at a distance from the mould cavity for the female element 20.

35 The mould parts 10, 11 of the mould ring which lie around the core 2 together delimit an annular sealing surface 15, by means of which the mould ring, in a zone between the mould cavity for the stopper 30 and the mould cavity for the female element 20,

bears in a sealing manner against the core 2 during the injection moulding, so that the mould cavities are completely separate from one another.

- 5 The mould 1 is provided with at least one first runner 16, which opens out in the mould cavity for the stopper 30, and also with at least one second runner 17, which opens out in the mould cavity for the female element 20.
- 10 During the injection-moulding of the assembly using the mould 1, it is preferable for a first plastics material to be injected into the mould cavity for the stopper 30 and for a second plastics material, which is different from the first plastics material, to be injected into the mould cavity for the
- 15 female element 20.

In one possible embodiment, the first plastics material of the stopper 30, after cooling, has a different hardness from the second plastics material of the female element 20. This

20 difference in hardness can advantageously be utilized for the sealing action of the stopper which is to be achieved and for reliable coupling of the stopper to the head of the core and/or any male element which is to be used.

- 25 If the plastics material for the female element 20 were to be relatively soft, if the female element is used in combination with a male element which is to be fitted into the bore in the female element, the relatively soft quality of the female element could be used to obtain a seal between the female
- 30 element and the male element. In particular, it would be possible to dispense with a separate sealing ring between the female and male elements.

To achieve a high production rate, it is preferable for the

35 injection-moulding of the first and second plastics materials to take place substantially simultaneously.

The head 4 of the core 2 is designed in such a manner that,

after the injection-moulding, the stopper 30 is clamped to the core 2, in such a manner that, after the mould parts 10, 11, 12 which lie around the core have been moved apart, the stopper 30 can be pulled into the bore 27 in the female element 20 with the aid of the core 2, the said element 20 then being supported on an abutment (not shown).

With the stopper 30 which is illustrated, the clamping onto the core 2 is achieved in particular by the inwardly facing hook fingers 38 which are formed during the injection-moulding.

The mould 1 also makes it possible for a plastics material to be injected only into the mould cavity for the female element, without any plastics material being injected into the mould cavity for the stopper, or vice versa.

As can be seen clearly from Figure 1, the third mould part 12 forms that wall of the mould cavity for the stopper 30 which lies opposite the head 4 of the core 2, as well as an adjoining annular mould-cavity wall 42 which corresponds to an annular sealing surface 43 of the stopper 30. In this way, the said sealing surface 43 is free of partial seams and, in the closed position of the assembly, bears against the annular seat 29, which is likewise free of partial seams, of the female element 20.

CLAIMS

1. Mould for the injection-moulding of an assembly for creating a closable fluid connection, which assembly comprises a female element and a stopper, the female element having a body with a bore which extends through the body and with a seat, which extends around the bore, for the stopper, which is used to close off the bore, the mould comprising a core with a core body and a head which forms the free end of the core, the head of the core defining a part of the stopper, and the core body defining the bore in the female body, which mould furthermore comprises a mould ring composed of a plurality of mould parts, which mould parts can be moved apart in order for the assembly to be ejected after injection-moulding, the mould ring extending around the core and, together with the core, delimiting a mould cavity for the stopper and a mould cavity, which lies in line with the mould cavity for the stopper, for the female element, one or more first runners being provided in the mould for supplying plastic to the mould cavity for the stopper, **characterized in that** the core and the mould parts are designed in such a manner that the mould cavity for the stopper is situated at a distance from the mould cavity for the female element, and in that the mould parts of the mould ring which lie around the core together delimit an annular sealing surface, by means of which the mould ring, in a zone between the mould cavity for the stopper and the mould cavity for the female element, bears in a sealing manner against the core during injection moulding, so that the mould cavities are completely separate from one another, and in that one or more second runners are provided, which open out in the mould cavity for the female element.

2. Mould according to claim 1, in which the stopper has a cavity which is open on the side of the female element, substantially in line with the bore in the female element, and in which the head of the core defines the cavity in the stopper.

3. Mould according to claim 1 or 2, in which the mould ring comprises a first mould part and a second mould part, which each extend over 180° around the core and which together
5 delimit the annular sealing surface by means of which the mould ring bears in a sealing manner against the core in a zone between the mould cavities during the injection moulding.

4. Mould according to one or more of claims 1-3, which
10 comprises a mould part which delimits that wall of the mould cavity for the stopper which lies opposite the head of the core and also an adjoining annular mould-cavity wall, in accordance with an annular sealing surface of the stopper, which sealing surface, in the closed position of the assembly, bears against
15 the annular seat of the female element.

5. Mould according to one or more of the preceding claims, in which the head of the core is designed in such a manner that, after the injection moulding, the stopper clamps onto the
20 core, in such a manner that after the mould parts surrounding the core have been moved apart, the stopper can be pulled into the bore in the female element with the aid of the core.

6. Mould according to one or more of the preceding claims, in which the mould cavity for the stopper, on that side of the stopper which faces the female element, defines elastic hook members with inwardly and outwardly directed hook surfaces, the mould cavity for the female element forming a shoulder in the bore of the female element, behind which shoulder the outwardly
30 directed hook surfaces engage when the stopper is in its seat, and in which the inwardly directed hook surfaces can engage on a shoulder of a male element which is to be fitted into the bore, the mould cavity for the stopper being such that one or more first hook members and one or more second hook members are
35 formed on the stopper, distributed around the circumference, the first hook members each having an outwardly directed hook surface and the second hook members each having an inwardly directed hook surface.

7. Method for injection-moulding an assembly for creating a closable fluid connection, using a mould according to one or more of the preceding claims.

5

8. Method according to claim 7, in which a first plastics material is injected into the mould cavity for the stopper, and a second plastics material is injected into the mould cavity for the female element.

10

9. Method according to claim 8, in which the first plastics material, used for the stopper, after cooling has a different hardness from the second plastics material, used for the female element.

15

10. Method according to one of claims 7-9, in which the injection-moulding of the first and second plastics materials takes place substantially simultaneously.

20

11. Method for injection-moulding an assembly for creating a closable fluid connection using a mould according to one or more of the preceding claims 1-6, in which plastics material is only injected into one of the mould cavities, and no plastics material is injected into the other mould cavity.

25

12. Assembly for creating a fluid connection which is produced by injection-moulding using a mould according to one or more of claims 1-6 and optionally a method according to one or more of claims 7-11.

30

13. Assembly for creating a closable fluid connection, which assembly comprises a female element and a stopper, the female element having a body with a bore which extends through the body and with a seat, which extends around the bore, for the stopper, which is used to close off the bore, the stopper being provided, on the side which faces the female element, with elastic hook members with inwardly and outwardly directed hook surfaces, the bore of the female element forming a shoulder,

35

behind which the outwardly directed hook surfaces engage when the stopper is in its seat, and it being possible for the inwardly directed hook surfaces to engage on a shoulder of a male element which is to be fitted into the bore,

5 characterized in that the stopper is provided with one or more first hook members and with one or more second hook members distributed around the circumference, the first hook members each having an outwardly directed hook surface and the second hook members each having an inwardly directed hook surface.

10

14. Assembly according to claim 13, in which the first and second hook members are arranged alternately around the circumference of the stopper.

15 15. Assembly according to claim 13 or 14, also comprising a male element having a tube-shaped part which fits into the bore in the female element and is provided with an internal passage for the fluid, the male element having a head and a shoulder which lies behind the head, and having a recess for
20 accommodating the inwardly facing hook members of the stopper, with the result that the stopper is coupled to the male element.

25 16. Assembly according to one or more of claims 12-15, the assembly being designed in such a manner that the stopper is clear of the bore when the male element is fitted completely into the bore.

30 17. Assembly according to one of claims 12-15, in which the stopper projects part way into the bore when the male element has been fitted completely into the bore.

35 18. Assembly according to one or more of claims 12-17, produced using a mould according to one or more of claims 1-6 or method according to claims 7-11.

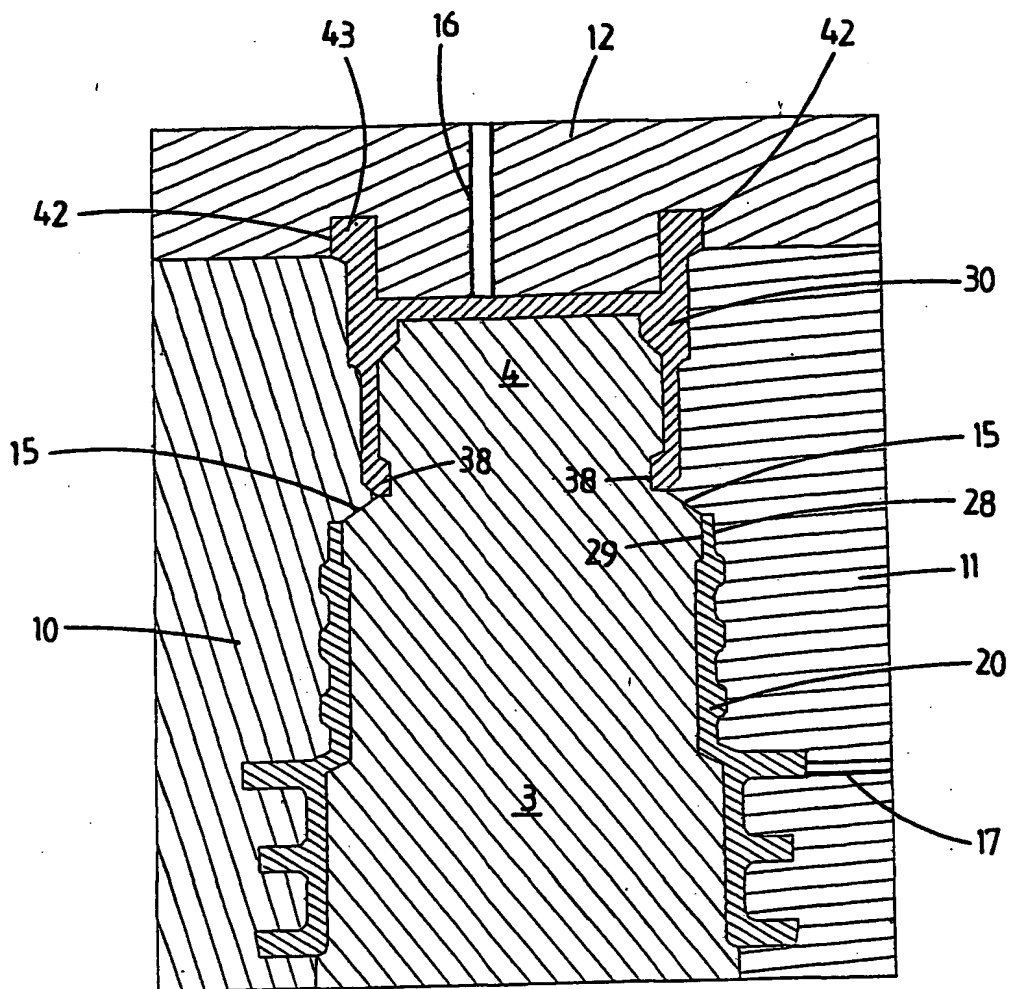


Fig. 1

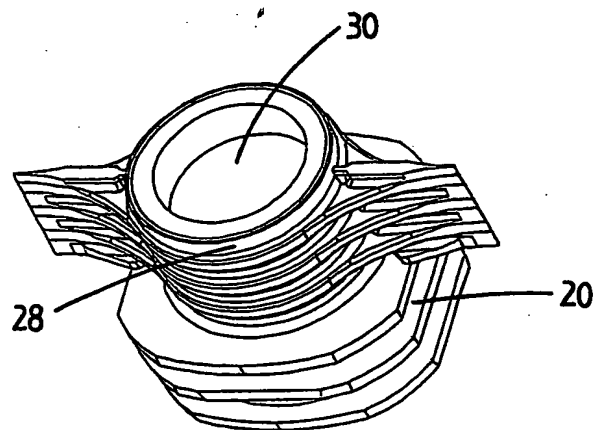


Fig. 2

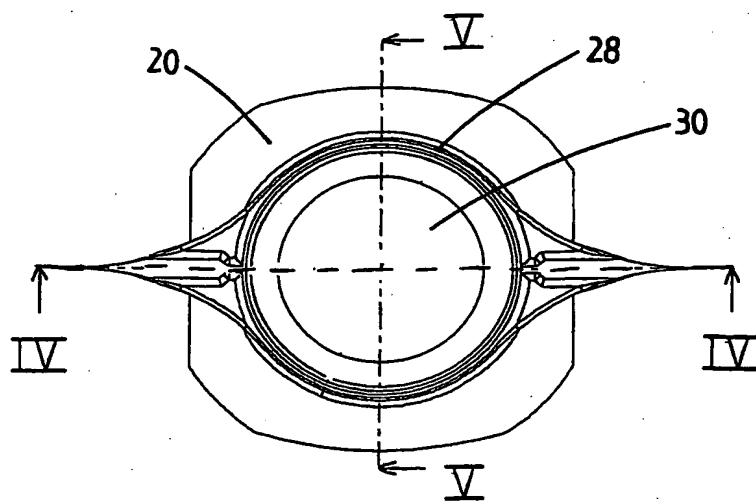


Fig. 3

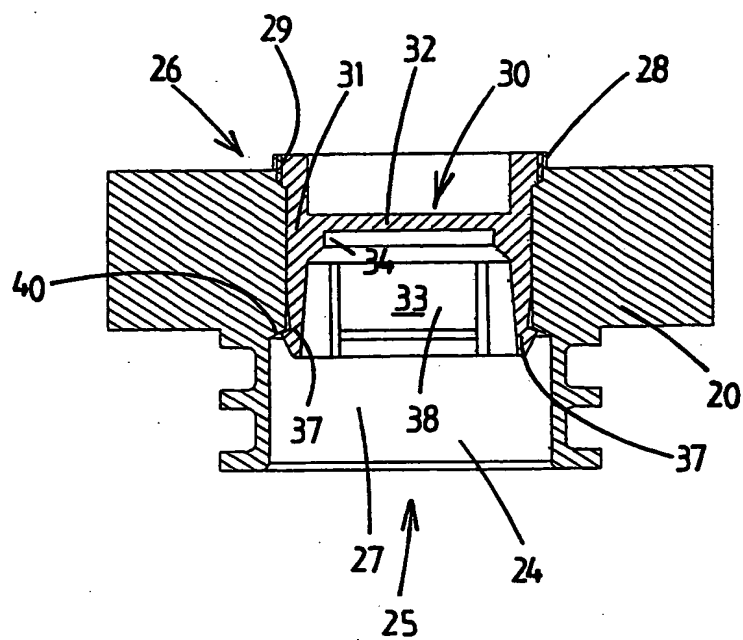


Fig. 4

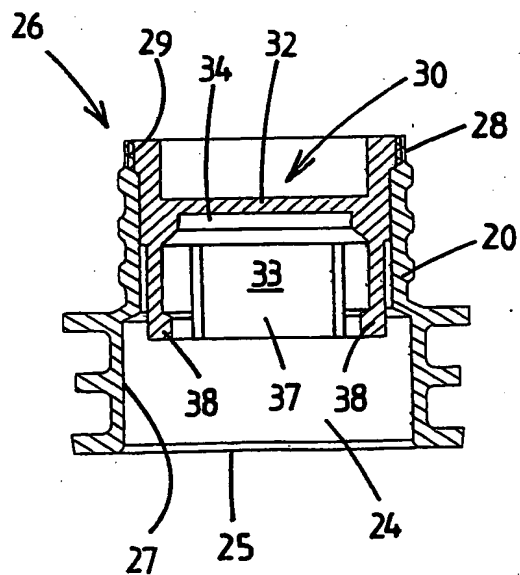


Fig. 5

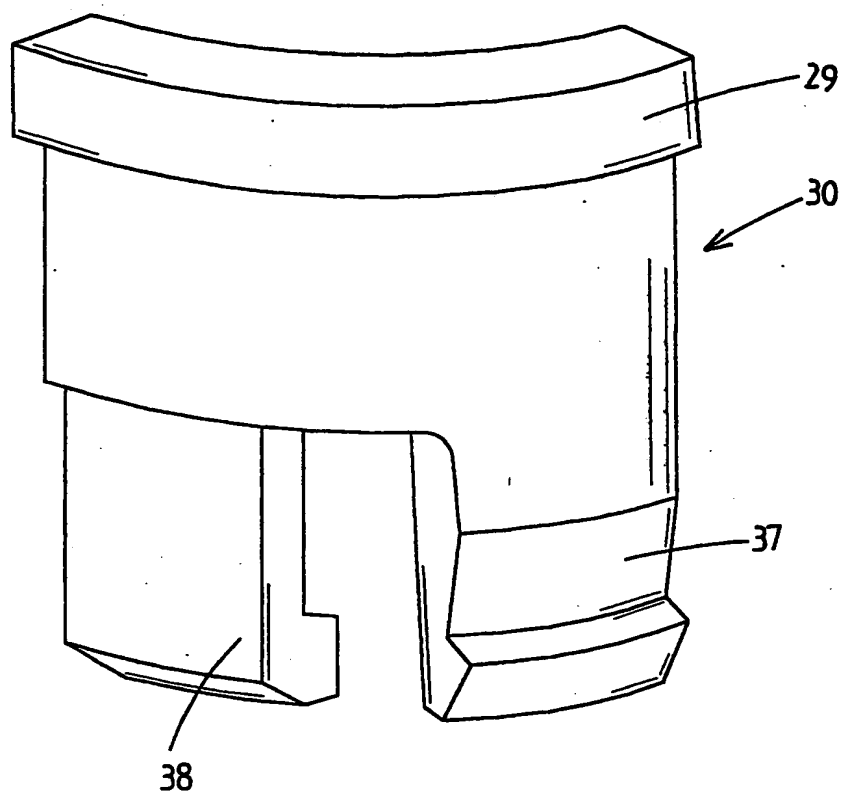


Fig. 6

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B29C69/00 B67D3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 11 63 527 B (DEUTSCHE PLAX G M B H) 20 February 1964 (1964-02-20) the whole document	1,3,5,7, 8,10,12
X	US 3 461 488 A (CROYLE JACK V) 19 August 1969 (1969-08-19) the whole document	1,5,7,12
A	WO 95 22494 A (PORTOLA PACKAGING INC) 24 August 1995 (1995-08-24) the whole document	1,7,12
A	WO 00 68607 A (VLASBLOM CASPARUS) 16 November 2000 (2000-11-16) page 8, line 21 -page 9, line 27; figures 14-17	13,15-17
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex

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PCT/NL 02/00642

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